

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Takeshi SAKAMOTO et al.

Application No.: 10/788,464

Filed: March 1, 2004

For: METHOD OF MANUFACTURING RARE-EARTH MAGNET, AND PLATING
BATH

Group Art Unit: 1795

Examiner: E. WONG

Docket No.: 118870

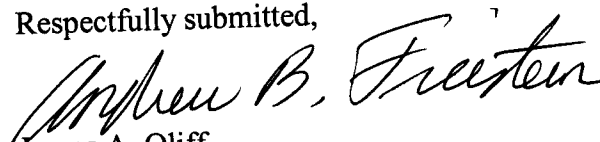
SUPPLEMENTAL RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Further to the Amendment and 1.132 Declaration filed August 28, 2008, Table 2
referenced in the Amendment and Declaration was inadvertently not attached to the
Declaration. Therefore, attached is a duplicate copy of the 1.132 Declaration with Table 2
attached, as indicated on the August 28, 2008 Amendment.

Respectfully submitted,


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DECLARATION UNDER 37 C.F.R. §1.132

I, Takeshi SAKAMOTO, a citizen of Japan, hereby declare and state:

1. I have a Master's degree in Applied Chemistry which was conferred upon me by Graduate School of Engineering, Hokkaido University in Sapporo, Japan in 1990.

2. I have been employed by TDK Corporation since 2000 and I have had a total of 8 years of work and research experience in Plating, Battery, Corrosion Science, and Electrochemistry.

3. I am a member of The Institute of Professional Engineers Japan, The Electrochemical Society of Japan, The Surface Finishing Society of Japan and Japan Society of Corrosion Engineering.

4. My publications include the following works in this field:

Y. Nukoko, T. Ohtsuka and T. Sakamoto, "Passivation Oxide Film on Nb-Fe-B Permanent Magnets in Borate Buffer Solution by Ellipsometry," Corrosion Science 49, (2007) 4005-4014.

T. Sakamoto et al., "Alkoxide-CVD metal oxide surface coating on aluminum and improvement effect on pitting corrosion resistance," Kei Kinzoku (Light Metals), Vol. 41, 522-527 (1991).

5. I am a named inventor in the above-captioned patent application.

6. I have a professional relationship with the Assignee of the above-identified patent application. In the course of that professional relationship, I received compensation directly from the Assignee for my work relating to electric parts. I am being compensated for my work in connection with this Declaration.

7. I and/or those under my direct supervision and control conducted ten experimental examples of a method of manufacturing a rare-earth magnet. The examples are represented in the attached Table 2 as Experimental Examples 1-10.

8. In Experimental Examples 1-10, the first plating baths were each prepared by the same method as that of Example 2 of the present specification, except Experimental Examples 1-10 include the compositions of nickel sources, conductive salts, pH stabilizers and semi-brighteners described in Table 2.

9. Experimental Examples 1-3 show that the claimed "concentration of the nickel source of 0.3 mol/l to 0.7 mol/l on a nickel atom basis and a conductivity of 80 mS/cm or over," as recited in claim 1, are critical ranges in the method of manufacturing a rare-earth magnet that unexpectedly improve the corrosion resistance of the rare-earth magnet by preventing the rare-earth-rich phase from leaching out and reducing the production of pinholes.

10. In Experimental Examples 1-3, the method of manufacturing a rare-earth magnet includes the first plating bath having a concentration of the nickel source of 0.3 mol/l to 0.7 mol/l on a nickel atom basis, and a conductivity of 80 mS/cm or over. As Table 2

indicates, each of these three manufacturing methods produce a rare-earth magnet that pass the high-temperature high-humidity test, and the salt spray test.

11. On the other hand, Experimental Examples 4-10, describe methods of manufacturing a rare-earth magnet that include a nickel concentration and/or a conductivity that is outside of the claimed critical ranges. As a result, Experimental Examples 4-10 each depict a method of manufacturing a rare-earth magnet that fails both the high-temperature high-humidity test, and the salt spray test.

12. For example, Experimental Example 4 includes a nickel concentration of 0.27 mol/l (nickel chloride) and a conductivity of 182 mS/cm in the first plating bath. Thus, Experimental Example 4 includes a nickel concentration that is 0.03 mol/l lower than the minimum claimed nickel source concentration of 0.30 mol/l in the first plating bath. Under the high temperature high humidity test, Experimental Example 4 showed plating film bulge, and under the salt spray test, Experimental Example 4 showed plating film peeling. Thus, even when the nickel concentration is decreased by as little as 0.03 mol/l in the first plating bath, the method of manufacture provides undesirable properties.

13. Furthermore, Experimental Example 7, provided in the attached Table 2, shows the criticality of a conductivity of 80 mS/cm or over. Experimental Example 7 includes a nickel concentration of 0.7 mol/l in the first plating bath, and also includes a conductivity of 78 mS/cm in the first plating bath. Thus, Experimental Example 7 includes a conductivity that is 2 mS/cm lower than the claimed minimum of 80 mS/cm. However, the method of manufacturing of Experimental Example 7 produces a rare-earth magnet that fails the high temperature high humidity test, by showing corrosion, and fails the salt spray test, by showing plating film bulge.

14. The results in Table 2 show that even if the protective film is formed by electroplating with the use of a first plating bath having a nickel source concentration very

near the claimed range of 0.3 mol/l to 0.7 mol/l, or having a conductivity only slightly less than the claimed 80 mS/cm, many pinholes are produced and the examples fail the high temperature high humidity test and salt spray test.

15. Therefore, the claimed ranges of "concentration of the nickel source of 0.3 mol/l to 0.7 mol/l on a nickel atom basis and a conductivity of 80 mS/cm or over," as recited in claim 1, are critical ranges in the method of manufacturing a rare-earth magnet that unexpectedly improve the corrosion resistance of the rare-earth magnet by preventing the rare-earth-rich phase from leaching out and reducing the production of pinholes.

16. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: August 28, 2008

Takeshi Sakamoto
Takeshi Sakamoto

(Table 2)

	FIRST PLATING BATH			SECOND PLATING BATH		HIGH-TEMPERATURE HIGH-HUMIDITY TEST	SALT SPRAY TEST
	COMPOSITION		CONDUCTIVITY mS/cm	COMPOSITION			
EXPERIMENTAL EXAMPLE 1	NICKEL SULFATE LITHIUM CHLORIDE BORIC ACID SEMI- BRIGHTENER	0.7 M 0.5 M 0.5 M ADEQUATE AMOUNT	82	NICKEL SULFATE LITHIUM CHLORIDE BORIC ACID BRIGHTENER	0.7 M 0.5 M 0.5 M ADEQUATE AMOUNT	PASS	PASS
EXPERIMENTAL EXAMPLE 2	NICKEL SULFATE POTASSIUM CHLORIDE BORIC ACID SEMI- BRIGHTENER	0.3 M 1.0 M 0.7 M ADEQUATE AMOUNT	88	NICKEL SULFATE POTASSIUM CHLORIDE BORIC ACID BRIGHTENER	0.3 M 1.0 M 0.7 M ADEQUATE AMOUNT	PASS	PASS
EXPERIMENTAL EXAMPLE 3	NICKEL SULFATE AMMONIUM CHLORIDE BORIC ACID SEMI- BRIGHTENER	0.7 M 0.5 M 0.5 M ADEQUATE AMOUNT	82	NICKEL SULFATE AMMONIUM CHLORIDE BORIC ACID BRIGHTENER	0.7 M 0.5 M 0.5 M ADEQUATE AMOUNT	PASS	PASS
EXPERIMENTAL EXAMPLE 4	NICKEL CHLORIDE POTASSIUM CHLORIDE BORIC ACID SEMI- BRIGHTENER	0.27 M 1.5 M 1.0 M ADEQUATE AMOUNT	182	NICKEL CHLORIDE POTASSIUM CHLORIDE BORIC ACID BRIGHTENER	0.27 M 1.5 M 1.0 M ADEQUATE AMOUNT	PLATING FILM BULGE	PLATING FILM PEELING
EXPERIMENTAL EXAMPLE 5	NICKEL SULFATE LITHIUM CHLORIDE BORIC ACID SEMI- BRIGHTENER	0.27 M 1.0 M 0.7 M ADEQUATE AMOUNT	86	NICKEL SULFATE LITHIUM CHLORIDE BORIC ACID BRIGHTENER	0.27 M 1.0 M 0.7 M ADEQUATE AMOUNT	PLATING FILM BULGE	PLATING FILM PEELING
EXPERIMENTAL EXAMPLE 6	NICKEL BROMIDE AMMONIUM SULFATE BORIC ACID SEMI- BRIGHTENER	0.27 M 0.4 M 1.6 M ADEQUATE AMOUNT	75	NICKEL BROMIDE AMMONIUM SULFATE BORIC ACID BRIGHTENER	0.27 M 0.4 M 1.6 M ADEQUATE AMOUNT	PLATING FILM BULGE	PLATING FILM PEELING
EXPERIMENTAL EXAMPLE 7	NICKEL SULFATE LITHIUM CHLORIDE BORIC ACID SEMI- BRIGHTENER	0.7 M 1.0 M 0.45 M ADEQUATE AMOUNT	78	NICKEL SULFATE LITHIUM CHLORIDE BORIC ACID BRIGHTENER	0.7 M 1.0 M 0.45 M ADEQUATE AMOUNT	CORROSION OBSERVED	PLATING FILM BULGE
EXPERIMENTAL EXAMPLE 8	NICKEL SULFATE POTASSIUM BROMIDE BORIC ACID SEMI- BRIGHTENER	0.75 M 1.0 M 0.7 M ADEQUATE AMOUNT	88	NICKEL SULFATE POTASSIUM BROMIDE BORIC ACID BRIGHTENER	0.75 M 1.0 M 0.7 M ADEQUATE AMOUNT	CORROSION OBSERVED	CORROSION OBSERVED
EXPERIMENTAL EXAMPLE 9	NICKEL CHLORIDE LITHIUM CHLORIDE BORIC ACID SEMI- BRIGHTENER	0.75 M 1.3 M 0.7 M ADEQUATE AMOUNT	132	NICKEL CHLORIDE LITHIUM CHLORIDE BORIC ACID BRIGHTENER	0.75 M 1.3 M 0.7 M ADEQUATE AMOUNT	CORROSION OBSERVED	CORROSION OBSERVED
EXPERIMENTAL EXAMPLE 10	NICKEL BROMIDE AMMONIUM SULFATE BORIC ACID SEMI- BRIGHTENER	0.27 M 0.4 M 1.6 M ADEQUATE AMOUNT	75	NICKEL BROMIDE AMMONIUM SULFATE BORIC ACID BRIGHTENER	0.27 M 0.4 M 1.6 M ADEQUATE AMOUNT	PLATING FILM BULGE	PLATING FILM PEELING